Environmental Management Division

Environmental Management Services

Bathymetry and Morphometry of Trout and Cliff Lakes

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BATHYMETRY AND MORPHOMETRY OF TROUT AND CLIFF LAKES

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ABSTRACT

Bathymetric maps of Trout and Cliff Lakes were prepared and are presented with tables of calculated morphometric data. The maximum depth of Trout Lake is 43.3 m, with a surface area of 13.12 Km^2 and a volume of 2.133×10^8 m^3. Cliff Lake has a maximum depth of 17.9 m, a surface area of 2.42 Km^2 and a volume of 1.95×10^7 m^3.

SUMMARY

Concerns were expressed that the development of the Trout Lake Mine might affect the quality of water flowing from Trout Lake to Cliff Lake. Flin Flon derives its water supply from Cliff Lake. Water Standards and Studies conducted a predevelopment study in 1981 with the aid of bathymetric and morphometric information obtained in 1980. This report details the data obtained in 1980.

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INTRODUCTION

Hudson Bay Mining and Smelting Co. Ltd. is presently developing Trout Lake Mine on the western shore of Trout (Embury) Lake. Water Standards and Studies conducted a pre-development water quality assessment of Trout and Cliff Lake in July 1981. In order to plan the study, an accurate depth map was required for each lake. This report details bathymetric and morphometric information obtained during this study.

AREA DESCRIPTION

Trout and Cliff Lakes lie northeast of Flin Flon in the Precambrian Shield region of Manitoba. West of Cliff Lake is a Missi series of conglomerate, quartzite, grey wacke and derived schists. This is separated from the Amisk group, which surrounds Trout Lake, by a fault line running from the south end of Cliff Lake to the Northwest Arm of Schist Lake. The Amisk group is comprised of volcanic flows and breccias, minor sedimentary and mafic intrusive rocks. There is also a pocket of granite, granodiorite, tonalite and granitic gneisses situated between the two lakes. Deposits of minerals in this area include pyrite, arsenopyrite, sphalerite, chalcopyrite, galena, gold, chromium, copper and zinc sulphides (summarized from Davies et al, 1962).

The area has a typical Precambrian topography of low rugged hills and ridges interspersed with bogs and streams. The soil is grey wooded podzol upon which has developed a typical northern coniferous forest containing black and white spruce, jackpine, and stands of aspen and willow (Weir 1960).

Trout Lake

Trout Lake is located between longitudes 101° 46' W and 101° 52' W,

and latitudes 54° 47' N and 54° 51' N. It is oriented in a northwest to southeast direction, and lies about 5 Km. northeast of Flin Flon. It is an ultra-oligotrophic lake 9.05 Km. long and averages 1.45 Km. wide. The lake has a surface area of 13.12 Km^2, 0.14 Km^2 of which are islands. The maximum depth is 43.3 m and averages 16.26 m. The volume has been calculated * to be 2.133×10^8 m^3.

Water enters through Annabel Creek from the west as well as numerous small streams draining lakes to the north. Drainage from Trout, to Manistikwan (Big Island) Lake is controlled by a dam to maintain sufficient levels for the domestic water supply for the town of Flin Flon. Water is piped from the northern end of Trout Lake to Cliff Lake and then on to the town.

The shoreline is rugged with rock outcrops and several shallow bays along the northwest and northeast sides of the lake. Access is via the Trout Lake Mine Road.

Cliff Lake

Cliff Lake is located between longitudes 101° 50' W and 101° 52' W, and latitudes 54° 47' N and 54° 50' N. It is an oligotrophic lake 3.51 Km. long and averages 0.69 Km. wide. The lake has a surface area of 2.42 Km^2 of which 0.01 Km^2 are islands. The maximum depth is 17.9 m, with the average being 8.06 m. The volume of water was calculated* to be 1.95×10^7 m^3.

Cliff Lake has a rugged shoreline rising sharply along the eastern side.

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* From data collected August 1980.

The south and western sides have rock outcrops broken up by low lying swamp areas.

Water enters via the pipeline from Trout Lake and also from some very minor flows at the south end. The major outflow is water used by the town of Flin Flon.

METHOD

Echograms were obtained using a Furuno Mark II battery-powered echo sounder in August 1980. The echo sounder was mounted on the side of a motor boat operated at approximately 8 Km. per hour. Transects were established by sight from a point to point basis.

Interpretations of the echograms were plotted on 1 12,500 scale maps of each lake. Depth contours were then manually drawn (Figures 1 and 2).

The shoreline length was measured with a Dietzgen map measurer; surface area measurements were obtained using an Alpha P-27 planimeter.

RESULTS AND DISCUSSION

Morphometric data computed from the measurements of the depth contours is presented in Table 1.

Figures 1 and 2 are the resulting bathymetric maps for Trout and Cliff Lake, respectively. These maps have been reduced to allow for inclusion in this report.

TABLE 1. Morphometry* of Trout and Cliff Lake.

	Z_m,m	$\overline{Z}$	Area(m^2)	Volume(m^3)	L(km)	D_L
Trout	43.3	16.261	13.120	2.133×10^8	48.64	3.79
Cliff	17.9	8.061	2.419	1.950×10^7	10.88	1.97

Abbreviations: Z_m,m - maximum depth

$\overline{Z}$ - mean depth

L(km) - shoreline length

D_L - development of shoreline

*Calculations from Hutchinson, 1957.

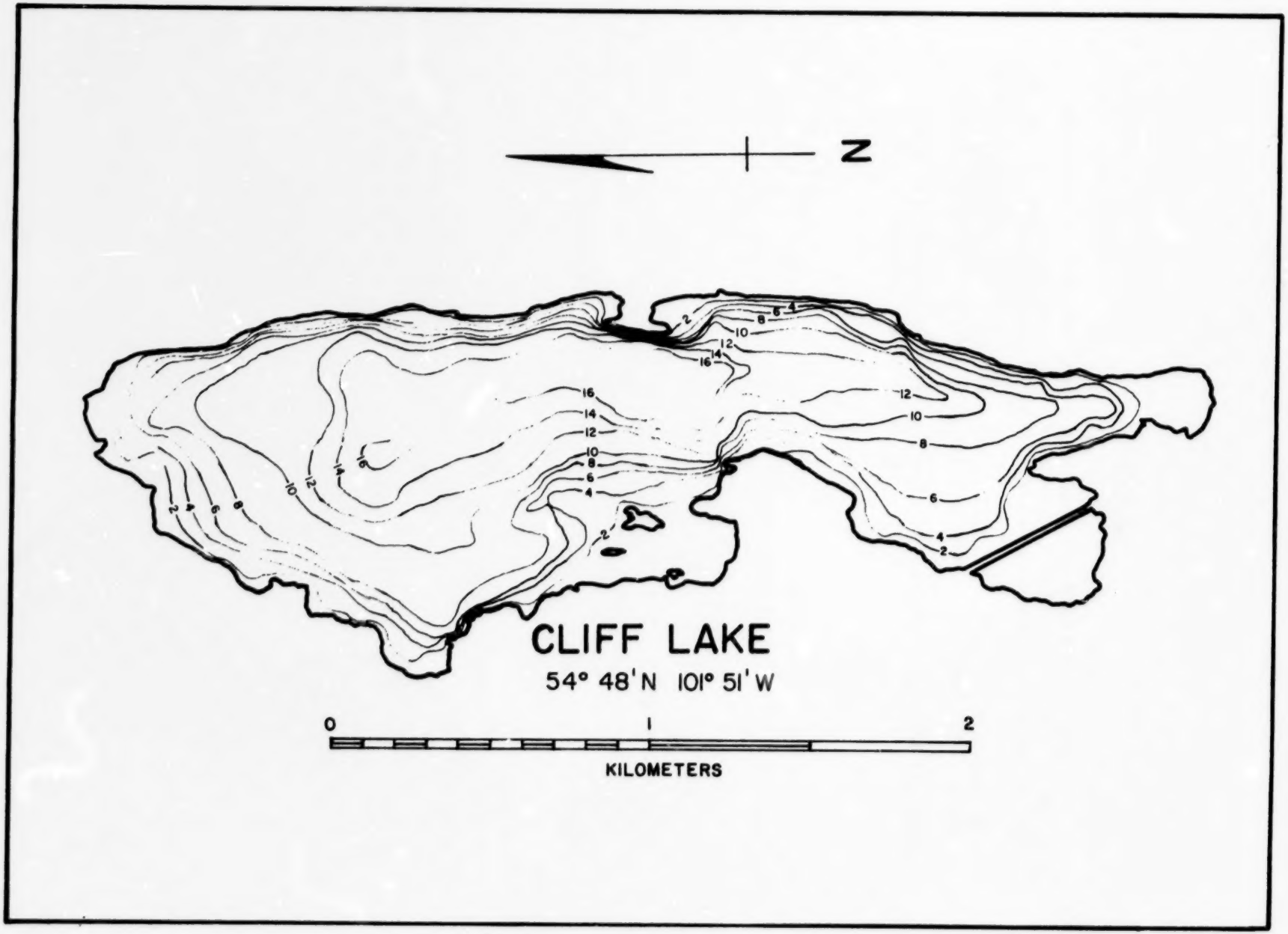

FIGURE 2. Depth Map of Cliff Lake.

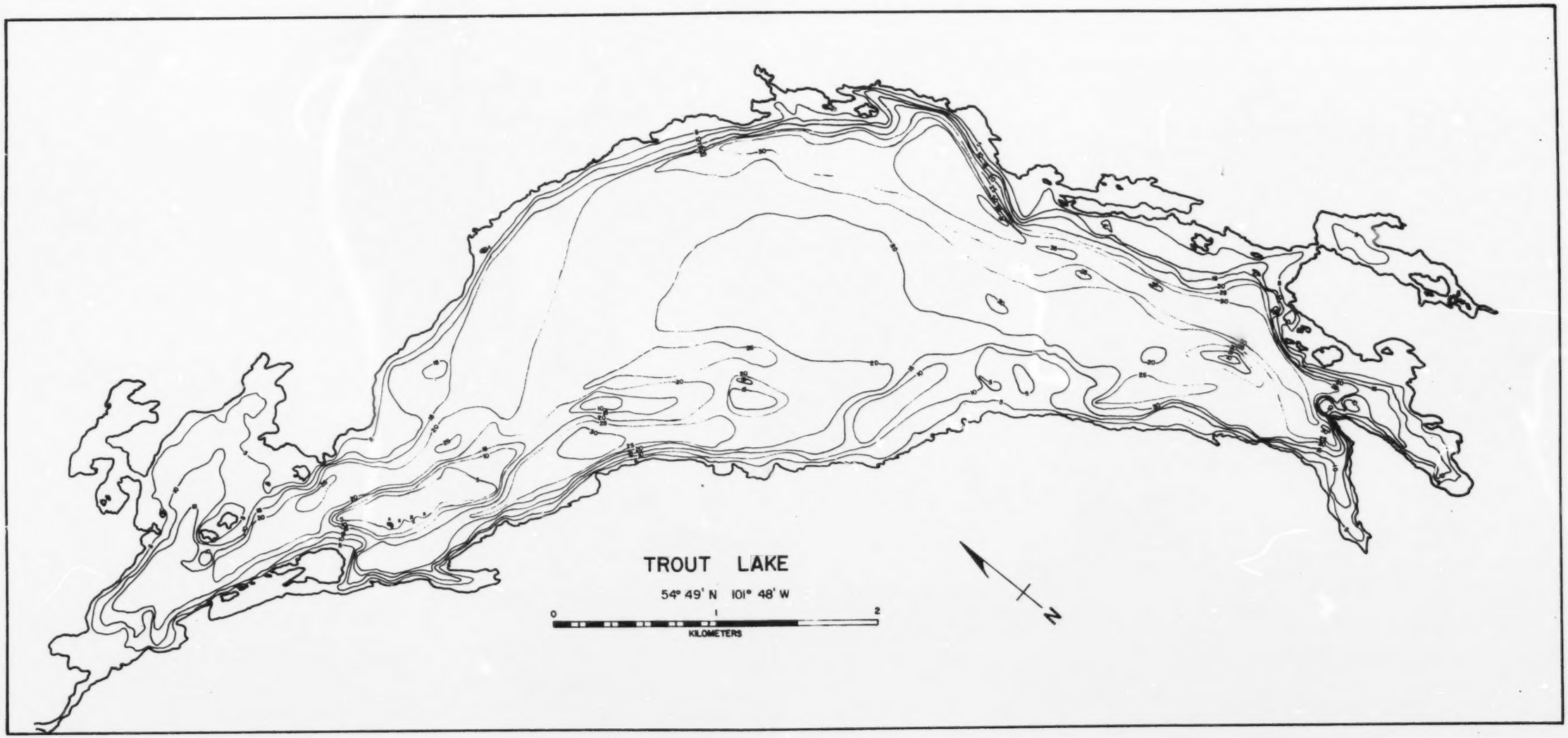

FIGURE 1. Depth Map of Trout Lake.

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